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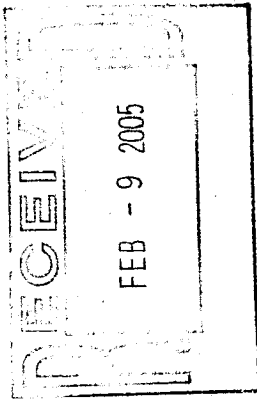
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I would like to dedicate this book to a number of people.
First to my wife, Penny, and to my parents;
and also to all those who took the time
to share their knowledge with me.

crystal oscillator (XO)

- *Oven-controlled crystal oscillator (OCXO)*—placement of the piezoelectric electric element in a constant temperature oven to prevent frequency changes due to environmental temperature changes.
- *Temperature-compensated voltage-controlled crystal oscillator (TCVCXO)*—an oscillator whose frequency is precisely controlled by both temperature control and compensation.
- *Voltage-controlled crystal oscillator (VCXO)*—a piezoelectric-controlled oscillator in which small frequency adjustments may be achieved by applying an input control voltage.
- *Oven-controlled voltage-controlled crystal oscillator (OCVCXO)*—a crystal oscillator in which temperature control is used to stabilize the frequency over environmental temperature changes, but the precise frequency can be set by an externally applied control voltage.
- *Microcomputer-compensated crystal oscillator (MCXO)*—a piezoelectric oscillator in which deviations from a desired frequency are minimized by a computer whose control output is algorithmically related to the oscillator's open-loop characteristics and sense inputs.

CS (1) An abbreviation of Circuit Switched. (2) An abbreviation of Convergence Sublayer. In ATM, where header and trailer information is added; before segmentation. (3) An abbreviation of Coordinated Single-Layer. (4) An abbreviation from Carrier System.

CS-MUX An acronym from Circuit Switched Multiplex.

CSA (1) An abbreviation of the Canadian Standards Association. The Canadian national standards-setting and certification agency (equivalent to the Underwriters Laboratories). (2) An abbreviation of Carrier Service Area. The region defined by the local loop length out of a central office (CO) or remote terminal.

CSA T-528 The Canadian equivalent of the EIA-606 standard.

CSA T-529 The Canadian equivalent of the EIA-568 standard.

CSA T-530 The Canadian equivalent of the EIA-569 standard.

CSBS An abbreviation of China State Bureau for Standardization. The Chinese national standards-setting agency. See also *CCEE*.

CSC (1) An abbreviation of Circuit Switched Channel (or Connection). (2) An abbreviation of Circuit Switched Cellular. (3) An abbreviation of Common Signaling Channel.

CSDC An abbreviation of Circuit Switched Digital Capability.

CSDN An abbreviation of Circuit Switched Digital Network.

CSE An abbreviation of Coordinated Single-Layer Embded.

CSELT An acronym of Centro Studi E Laboratori Telecomunicazioni (Telecommunications Study Center and Laboratory).

CSFS An abbreviation of Cable Signal Fault Signature. The unique signal reflected back from a transmission line when using time domain reflectometry (TDR) to test the soundness of the line.

CSID An abbreviation of Calling Station Identifier.

CSLIP An acronym from Compressed Serial Line Internet Protocol. Like SLIP, a protocol that can provide a serial modem connection to a network; however, it is faster than SLIP.

CSM An abbreviation of Combined Symbol Matching.

CSMA (1) An abbreviation of Common Spectrum Multiple Access. (2) An abbreviation of Carrier Sense Multiple Access. A local area

CSN

network medium access technique in which multiple stations connected to the same channel are able to sense the transmission activity of other nodes on that channel and to defer transmission while the channel is active. Also called *collision sense multiple access*.

CSMA/CA An abbreviation of Carrier Sense Multiple Access with Collision Avoidance. A network protocol for addressing the problem of two or more nodes attempting to access the LAN at the same time. With *CSMA/CA*, a node wishing to send information first monitors the line for a activity; if none is heard, it sends a request to send (*RTS*) to the designated receiving station. If the sending node receives the receiving station clear to send (*CTS*) message within a predefined time period, transmission begins. If no *CTS* is received, the sending node assumes there is a collision and waits to try later (called the *deferral time*).

In Apple's LocalTalk network architecture, the minimum interframe gap (IFG)—the time between successive frames (such as *RTS* and *CTS* or between *CTS* and data transmission)—is 200 μ s.

CSMA/CD An abbreviation of Carrier Sense Multiple Access with Collision Detection. A network protocol, defined by IEEE 802.3, for addressing the problem of two or more nodes attempting to access a LAN at the same time.

- *CS—Carrier sense* means that any node wishing to transmit, monitors the LAN first. If the LAN is idle, the node proceeds with transmission. If the LAN is busy (that is, a carrier is detected), the node waits at least 9.6 μ s (the minimum interpacket gap time) after the LAN is idle before transmitting. (The delay is called the *deferral time*.)
- *MA—Multiple access* means that any node with pending traffic may gain admittance to the LAN essentially through autonomous behavior. No central station or master node is needed to decide which node is able to transmit and when.
- *CD—Collision detection* means that the circumstance of two or more nodes attempting to access an idle network at the same time (collision) is detectable and that an appropriate retry procedure is instituted.

In the event of a collision, any node detecting the collision will continue to transmit for a fixed time in order to ensure that all other interfering nodes also detect the collision (a process known as *jamming*). After jamming, the node stops transmitting and waits a random period of time before retrying. In an attempt to reduce traffic offerings, the magnitude of the maximum random delay time is increased each time a consecutive collision is detected. The load-shedding algorithm is called the *truncated binary exponential backoff algorithm* (*binary exponential backoff* or *backoff algorithm*). The maximum random delay value is given by: $Max = (2^n - 1) \cdot 51.2 \mu$ s, where *n* is the number of consecutive collisions detected. The table on page 131 lists the maximum value for the random delay at a node detecting consecutive collisions. After 16 consecutive collisions are detected, an error is reported. Collision detection is generally accomplished by analog signal level detection at each transceiver. Each transmitter, when active, applies a modulated signal of approximately 2 V peak to peak onto the transmission line. When a signal greater than approximately 2.2 V is detected, a collision is assumed to have occurred. Because impedance discontinuities (and therefore reflections) are minimized at each node, a signal greater than 2 V must be due to the sum of two (or more) transmitters sending at the same time; hence, collision. See also *Alolha network*.

CSN An abbreviation of Carrier Service Node.

CSN

BINARY EXPONENTIAL BACKOFF ALGORITHM VALUES

Number of Collisions Detected	Maximum Random Delay (μ s)	Comments
0	9.6	Interpacket gap delay
1	51.2	1×51.2
2	153.6	3×51.2
3	358.4	7×51.2
4	768.0	15×51.2
5	1587.2	31×51.2
6	3225.6	63×51.2
7	6502.4	127×51.2
8	13056.0	255×51.2
9	26163.2	511×51.2
10	52377.6	1023×51.2
11	52377.6	
12	52377.6	
13	52377.6	
14	52377.6	
15	52377.6	
16	52377.6	Error is reported on 17

CSNET The acronym from Computer + Science NETwork. Merged with BITnet to form *CREN*.

CSP An abbreviation of Control Switching Point.

CSPDN An abbreviation of Circuit Switched Public Data Network.

CSR An abbreviation of Control (or Command) and Status Register.

CSTA An abbreviation of Computer Supported Telecommunications Application.

CSU (1) An abbreviation of Channel Service Unit. (2) An abbreviation of Central Switching Unit. (3) An abbreviation of Circuit Switching Unit. (4) An abbreviation of Customer Service Unit.

CSUnet An acronym from California State University Network. A network originally conceived to interconnect the campuses of the California state universities. It now is expanded to include Internet connectivity to all schools, community colleges, and libraries.

CT1 The "first generation" analog Cordless Telephone standard used in Europe (noncellular).

CT2 An abbreviation of Cordless Telephone 2nd generation. An interim ETSI cordless telephone standard using the 864-868 MHz band and FDMA/TDD modulation. Superseded by *DECT*. See also *DECT* and *IEEE 802.11*.

CT3 Ericsson's proprietary cordless telecommunications system.

CTAK An acronym from Cipher Text Auto Key.

CTD An abbreviation of Cumulative Transit Delay.

CTERM An acronym from Command TERMINal Protocol. Digital Equipment Corp's (DEC's) command terminal protocol that provides terminal sessions over DEChet.

CTI An abbreviation of Computer Telephony Integration.

CTIA (1) An abbreviation of the Cellular Telecommunications Industry Association. (2) An abbreviation sometimes used for the Computer Technology Industry Association (formerly the Micro-computer Industry Association).

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curve fitting compaction

CTIP An acronym from Commission on Computing, Telecommunications, and Information Policies.

CTL An abbreviation of control. Sometimes abbreviated CTRL. Generally shown as <CTL> (or <CTRL>) indicating a single key.

CTNE An abbreviation of Compañía Telecomunicación Nacional de España (National Telephone Company of Spain).¹

CTR An abbreviation of Common Technical Requirements.

CTRG An abbreviation of Collaboration Technology Research Group.

CTS (1) An abbreviation of Clear To Send (RS-232 signal CB, RS-449 signal CS, and ITU-T signal 108). It is a signal generated by the DCE to the DTE indicating that the DCE is ready to receive data from the DTE. (2) An abbreviation of Communications Technology Satellite. (3) An abbreviation of Conformance Testing Service.

CTX (1) An abbreviation of CenTreX. (2) An abbreviation of Clear to transmit (IX).

CU Shorthand for See You.

CUA (1) An abbreviation of Common User Access. In IBM's SAA environment, specifications for user interfaces that are intended to provide a consistent look across applications and platforms. That is, it sets guidelines for the appearance and actions of menu and dialog boxes, buttons, and help windows in a GUI environment. (2) An abbreviation of Commonly Used Acronyms.

CUI An abbreviation of Common User Interface.

CUL Shorthand for See You Later.

current The amount of charge (electrons) flowing past a point in a conductor per second. Current is measured in units of *amperes* (abbreviated a, A, or amp). 1 A of current is the flow of 1 *coulomb* of charge past a given point in a conductor in 1 second.

current loop A serial baseband transmission technique in which current rather than voltage is used to carry information. Currents in the order of a few milliamps to tens of milliamps are typically used in the loop. Current loop signaling is traditionally used in teletypewriter communications, a current flow indicating a marking condition (logical one) and no current indicating a spacing condition (logical zero).

curvature loss A synonym for *macroband loss*.

curve fitting compaction A data compaction technique in which an analytical expression is substituted for data to be stored or transmitted.

Examples of *curve-fitting compaction* include:

- The breaking up of a continuous function or curve into a series of straight-line segments, each approximating the arbitrary curve between its end points. The compacted information consists of each line segment's slope, intercept, and range.
- Use of a mathematical expression, such as a polynomial or a trigonometric function, and a single point on the corresponding curve instead of storing or transmitting the entire graphic curve or a series of points on it.
- The use of an expression (representing an a priori mathematical equation or procedure) and critical parameters to define the corresponding curve instead of storing or transmitting the entire graphic curve or a series of points on it. For example, a circle might be represented as n, x, y, r , where *n* is the number of the mathematical expression, *x*, *y* represents the center, *r* is the radius, and *f* indicates the figure fill type (solid empty cross-hatch, etc.)

voice grade channel A communications channel suitable for carrying speech but not necessarily good enough for high-speed data communications. *Voice grade* telephone lines have a usable bandwidth of only 3100 Hz, sufficient for only 2400- to 3000-baud transmissions. Because of the quantizing noise introduced by the analog-to-digital conversion in the coder-decoder (CODEC), multibit encoding techniques can increase the throughput to 33 600 bps in ITU-T V.34 modems, with only somewhat higher capabilities in the future. ITU-T V.90 modems can operate to 56 kbps in the downstream direction because they avoid the analog-to-digital conversion process in one direction. Also called a *voice grade line*. See also *Shannon limit* and *V.90*.

voice mail A system for recording, storing, retrieving, and delivering voice messages. It may be either a stand-alone device or integrated, to some extent, with a user's phone system. If the phone rings for a specified number of rings, it can default to a mailbox which delivers its prerecorded invitation to leave a message and records the results. Messages can be delivered at a prearranged time, tagged and edited.

Stand-alone *voice mail* is similar to a collection of answering machines but has added features such as call forwarding. Integrated systems indicate messages waiting via a light on a user's phone and/or an alphanumeric display.

voice-operated switch (VOX) A switching device that monitors the signal level on a transmitter's input. When the level exceeds a specified threshold, the transmitter is turned on and the receiver is turned off. When the level falls below that threshold, the transmitter is turned off. Also called *voice-operated transmit*.

voice over data (VOD) A method of sending voice and data simultaneously over a single telephone line.

There are several methods of accomplishing this task, e.g., frequency division multiplex (FDM) where the lower frequencies of a band are used for data transmission and the upper part of the band is used for voice. A second method is time division multiplex (TDM). The firmware to accomplish this is included in some modems. *Note:* The total message capacity of the telephone line is bounded by Shannon's limit. Therefore, when the voice option is in effect, the digital transport rate is reduced. See also *Shannon limit*.

voice PABX A private automatic branch exchange (PABX) for voice only circuits, e.g., a telephone exchange.

voice plus circuit A circuit carrying both voice and other services. Also called a *composited circuit*.

voice recognition See *speech recognition*.

VoIP An abbreviation of Voice Over Internet Protocol (IP).

VOIS An abbreviation of Voice Operated Information System.

VOL An abbreviation of VOLume.

volatile memory Memory that loses data when power is removed. Both dynamic random access memory—RAM (DRAM) and static RAM (SRAM) memories will lose data when power is removed. See also *nonvolatile memory*.

volatile storage A term that refers to any storage device (memory) in which the contents are lost when electrical power is removed.

volcas An acronym for Voice Operated Loss Control And Suppressor. A voice-operated system that prevents a two-way voice circuit from singing (oscillating) by attenuating one of the transmission directions at all times. The active direction is unimpeded, while the quiet path is attenuated.

volt (V) The unit of voltage, electromagnetic force, or potential difference.

One *volt* is defined as the potential difference across which 1 coulomb of charge will do 1 joule of work. Ohm's law relates voltage, current, and resistance with the statement, "One *volt* of potential difference is generated when one ampere of current flows through a resistance of one Ohm," or mathematically,

$$V = I \cdot R$$

where

V is the voltage,

I is the current, and

R is the resistance.

The SI symbol for the *volt* is *V*.

volt-ampere (VA) The unit of apparent power in the SI system. It is the product of the root-mean-square (RMS) voltage, the RMS current, and the cosine of the angle between them. Frequently abbreviated *voltamp*.

volt amperes reactive (vars) In alternating-current (ac) power transmission and distribution, the product of the root-mean-square (RMS) voltage and amperage (i.e., the *apparent power*), multiplied by the sine of the phase angle between the voltage and the current.

Var is properly expressed only in volt-amperes (VA)—not watts (W). (Only *effective power*, i.e., the actual power delivered to or consumed by the load, is expressed in watts.) *Vars* represents the power *not* consumed by a reactive load. To maximize transmission efficiency, therefore, *vars* must be minimized. This is accomplished by balancing capacitive and inductive loads, or by adding an appropriate capacitive or inductive reactance elements to compensate for reactive loads.

voltage The amount of energy available to move a certain number of electrons from one point to another in an electrical circuit. Also called *electromotive force (EMF)*.

voltage breakdown impulse ratio The ratio of the impulse voltage breakdown (*V_{IBD}*) of an entity to the dc breakdown voltage (*V_{DCBD}*), that is,

$$\delta_{ratio} = \frac{V_{IBD}}{V_{DCBD}}$$

Note that this ratio is never less than unity.

voltage-controlled oscillator (VCO) Any oscillator in which the output frequency can be set by a control signal (voltage). Neither amplitude nor waveshape of the oscillator output is intentionally changed by the control signal. See also *oscillator*.

voltage delay In electrochemical cells, a time delay between the application of a load to a battery source and the full operating voltage. The delay is dependent on the percentage of the battery capacity the load requires, the ambient temperature, and the cell chemistry.

voltage depression In electrochemical cells, an abnormal drop in terminal voltage, i.e., below the expected values during the discharge of a battery.

voltage keyed A term that refers to a system which incorporates a mechanical identifier on battery packs and devices to ensure only batteries of the correct voltage and polarity are connected to the device.

voltage reversal In electrochemical cells, a changing of the normal polarity of one or more cells due to overdischarge of the battery.

voltage standing wave ratio (VSWR) See *standing wave ratio*.

volume (1) A term that refers to the magnitude of an audible signal, i.e., signal level. (2) In computer hierarchical file structures, the highest level in a file computer's directory and file structure. (3) A portion of data, with its physical storage medium, that can be handled conveniently as a unit. Examples include a "floppy" diskette or a magnetic tape.

volume limiter A device that automatically limits the signal level in a circuit or portion of a circuit. The device may be hard limiting (clipping) or soft limiting (compression). See also *clipping* and *compressor*.

volume unit (vu) A quantitative measure of audio signal level (volume) in an electric circuit. The *volume unit* is numerically equal to the ratio of the signal to a reference volume expressed in decibels (dB). For sine waves, 0 vu is equal to 0 dBm; however, the term *vu* should not be used to express the results of measurements of a complex waveform made with a device whose characteristics differ from those of a standard volume indicator.

A *vu meter* is built and used in accordance with American National Standard C16.5-1942.

VOP An abbreviation of Velocity Of Propagation.

VOTS An abbreviation of VAX OSI Transport Service.

VOM (1) An abbreviation of Volt-Ohm-Milliammeter. A device for measuring circuit voltages, resistances, or current. (2) An abbreviation of Volt-Ohm-Meter.

V_{out} A symbol for output voltage.

VOX An acronym for Voice Operated Switch (X) or Voice Operated transmit (Xmit).

VP An abbreviation of Virtual Path.

VPC An abbreviation of Virtual Path Connection.

VPI An abbreviation of Virtual Path Identifier. See *ATM*.

VPL Generally, an abbreviation of Virtual Path Link.

VPN (1) An abbreviation of Virtual Private Network. (2) Sometimes an abbreviation from Virtual Public Network.

VPX An abbreviation of Virtual Path Cross connect.

VQC An abbreviation of Vector Quantizing Code. A voice compression technique that reduces speech transmission rates to 16 or 32 kbps.

VQL An abbreviation of Variable Quantizing Level. A voice-encoding method.

VR (1) An abbreviation of Virtual Route. (2) An abbreviation of Voltage Regulator.

VRAM An acronym for Video RAM. Basically, *VRAM* is normal RAM but is optimized for video applications. *VRAM* is generally dual ported, which enables the central processing unit (CPU) to load information into memory via the parallel port while the video controller is reading information via the serial port. Increasing *VRAM* size in a graphics interface card increases the number of colors possible and/or the number of pixels that can be displayed.

VRC An abbreviation of Vertical Redundancy Check.

VRML An abbreviation of Virtual Reality Modeling Language.

VRTP An abbreviation of VINES Routing update Protocol.

VRU An abbreviation of Voice Response Unit.

VRUP An abbreviation of VINES Routing Update Protocol.

VS An abbreviation of Virtual Storage.

VSAM An acronym for Virtual index Sequential Access Method.

VSAT An acronym for Very Small Aperture Terminal. A very small-diameter satellite receiving antenna made possible by increasing the *effective isotropic radiated power (EIRP)* of the satellite transmitter.

VSb An abbreviation of Vestigial SideBand.

VSE An abbreviation of Virtual Storage Extended.

VSF An abbreviation of Voice Store and Forward.

VSIA An abbreviation of Virtual Socket Interface Alliance.

VSM An abbreviation for Vestigial Sideband Modulation.

VSPC An abbreviation of Visual Storage Personal Computing.

VSPp An abbreviation of VINES Sequenced Packet Protocol.

VSWR An abbreviation of Voltage Standing Wave Ratio. See also *standing wave ratio*.

VSX An abbreviation of X/open Verification Suite.

VT (1) An abbreviation of Vertical Tab. (2) An abbreviation of Virtual Terminal. (3) An abbreviation of Virtual Tributary. A logical channel composed of a sequence of cells.

VT-100 A terminal designed by Digital Equipment Corporation (DEC) for its mainframe computers. Although the terminal itself has become obsolete, the protocol is now one of the major terminal standards that most modern communications programs emulate. Other terminals in the series include VT-54 and VT-102.

VTAM An acronym for Virtual Telecommunication Access Method. IBM's Systems Network Architecture (SNA) protocol and host communications program. The virtual access method for 3270 systems.

VTE An abbreviation of Virtual Tributary Envelope. The real payload plus any path overhead within a virtual tributary (VT) channel.

VTNS An abbreviation of Virtual Telecommunications Network Services.

VTOC An acronym for Volume Table Of Contents.

VTP An abbreviation of Virtual Terminal Protocol.

VTS An abbreviation of Virtual Terminal Service.

VTU An abbreviation of Video Teleconferencing Unit.

vu An abbreviation of Volume Unit.

VxD An abbreviation of Virtual Device Driver.